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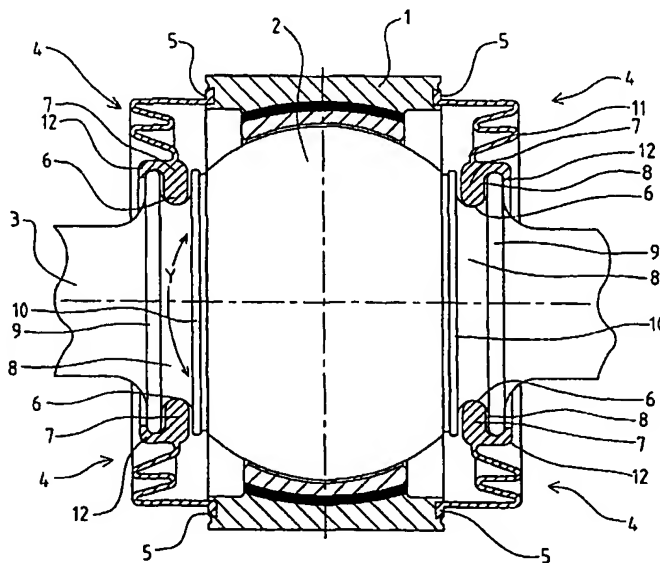
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[Continued on next page]

(54) Title: A SEALED SPHERICAL BEARING



(57) Abstract: A sealed spherical bearing having a bearing housing (1), a ball (2) located therein and a ring-like seal (4) having an inner edge (6) and an outer edge (5) located between the bearing housing (1) and the ball (2), one of the edges (5, 6) having a head (7) and a skirt (12) depending therefrom, the head (7) lying in an annular groove (8) formed in one of the ball (2) or the housing (1) and the skirt (12) lying on a lip (9) upstanding from the groove (8) to define at least two sealing lines between the seal (4) and the one of the ball (2) or the housing (1), the other edge of the seal being fixedly mounted to the other of the ball (2) or the housing (1).

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- *with amended claims*

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**(48) Date of publication of this corrected version:**

15 September 2005

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## A SEALED BEARING

This invention relates to a sealed bearing and more particularly to a  
5 sealed spherical bearing.

Figure 1 of the accompanying drawings illustrates a sealed spherical bearing 100 having a bearing housing 101 and a ball 102. A rod 103 extends from the ball 102. The ball 102 is free to rotate with respect to the housing 101  
10 in all directions, the only limitation being the stop provided by the rod 103 or a part of the ball knocking against the housing 101. A pair of ring-like rubber seals 104 are mounted on either side of the bearing housing between the bearing housing 101 and the ball 102 to protect the bearing surfaces between  
15 the ball 102 and the housing 101 from ingress of liquids such as water and contaminant particles. The seals 104 each have an outer edge 105 and an inner edge 106. The outer edge 105 is fixedly attached to the bearing housing 101 and the inner edge 106 terminates in a bulbous head 107 which rides in a groove 108 provided in the juncture between the ball 102 and the rod 103  
(which are incidentally integrally formed with one another). The seals 104 are  
20 provided with a series of concertina-like concentric folds 109 which collapse and expand in response to movement of the grooves 108 towards and away from the bearing housing 101 so that the sealing engagement of the bulbous heads 107 within the grooves 108 is maintained.

25 This arrangement functions adequately but ingress of water and contaminant particles still occurs.

It is an object of the present invention to seek to provide an improved sealed bearing.

Accordingly, one aspect of the present invention provides a sealed spherical bearing having a bearing housing and a ball located therein, the bearing housing having an outer race, an inner race and an annular elastomeric portion sandwiched between the races.

In order that the present invention may be more readily understood, embodiments thereof will now be described, by way of example, with reference to the accompanying drawings, in which:

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Figure 1 is a partial cross-section of a sealed spherical bearing not in accordance with the present invention;

Figure 2 is a partial cross-section of a sealed spherical bearing embodying the present invention; and

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Figure 3 is a partial cross-section of another sealed spherical bearing embodying the present invention.

Referring to Figure 2 of the accompanying drawings, a sealed spherical bearing embodying the present invention has a bearing housing 1 and a ball 2. A rod 3 extends from the ball 2 and is preferably integrally formed with the ball 2. The ball 2 is free to rotate with respect to the housing 1 in all directions, the only limitation being the stop provided by the rod 3 or a part of the ball knocking against the housing 1.

25

A pair of ring-like rubber seals 4 are mounted on either side of the bearing housing between the bearing housing 1 and the ball 2 to protect the bearing surfaces between the ball 2 and the housing 1 from ingress of liquids

such as water and contaminant particles. The seals 4 each have an outer edge 5 and an inner edge 6.

The outer edge 5 is fixedly attached to the bearing housing 1, preferably  
5 by being inserted into an annular groove formed around the bearing housing 1 and then staked or crimped in place. This provides a seal between the outer edge 5 and the bearing housing 1. The inner edge 6 terminates in a bulbous head 7 which rides in a groove 8 provided in the juncture between the ball 2 and the rod 3. The head 7 is free to ride in the groove by sliding in the groove  
10 and following any rotation of the head 7 with respect to the groove 8 as the ball 2 rotates with respect to the bearing housing 1. Thus, there is sliding contact between the head 7 and the groove 8 but the head 7 is maintained in sealing contact with the groove 8.

15 The grooves 8 are each in the form of a semi-circular trough terminating in an upstanding rounded lip 9 on one side, the inner side, and a straight sided annular wall 10 on the other side, the outer side.

The seals 4 are provided with a series of concertina-like concentric folds  
20 11 which collapse and expand in response to movement of the grooves 8 towards and away from the bearing housing 1 so that the sealing engagement of the bulbous heads 7 within the grooves 8 is maintained.

In addition to the seals 104 depicted in Figure 1, the annular bulbous  
25 head 7 is formed with a skirt 12 which projects from the head 7 and cups over the lip 9 on the outer side of the groove 8. The skirt 12 is directed radially inwardly from the head 7 and tapers from a root end at the head to a tip end.

The skirt 12 contacts at least one point of the lip 9 and preferably is in contact with an area of the upper surface of the lip 9. The contact points or contact area create a sealing line or band between the skirt 12 and the ball 2 or rod 3. This sealing line or band is in addition to the sealing line or band  
5 between the head 7 and the trough 8. Thus, there are provided two seals separating the bearing surfaces from any liquid or contaminant particles. In addition, the skirt 12 provides a run-off for liquid away from the seal between the skirt 12 and lip 9, thereby further enhancing the sealing performance of the seal. Preferably, as shown in Figure 2, a gap is provided between the sealing  
10 line defined by the head 7 and the sealing line defined by the skirt 12.

The bearing depicted in Figure 2 is a so-called hybrid bearing. It should be appreciated that the spherical bearing need not be a hybrid bearing with an elastomeric portion - non-hybrid bearings also benefit from the improvement in  
15 the seal.

The spherical bearing may have a bearing housing in the form of a half cup meaning that only one side of the spherical bearing needs sealing, in which case only a single seal 4 is provided, see Figure 3. It is also possible for one  
20 side of the bearing housing to be capped so that only one seal is needed.

The mechanical arrangement in which the outer edge of the seal is fixedly mounted to the housing and the inner edge rides in a groove in the ball could be reversed such that the inner edge of the seal is fixedly mounted to the  
25 ball and the outer edge rides in a groove in the bearing housing.

The groove 8 is shown in Figure 2 as being at the juncture between the integrally formed ball 2 and rod 3. It is to be appreciated that the invention is not limited to the groove 8 being located at this position. The groove could be

located more towards the centre of the ball 2 or further towards the rod 3, away from the ball centre.

In the present specification "comprises" means "includes or consists of"  
5 and "comprising" means "including or consisting of".

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process  
10 for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

**CLAIMS:**

1. A sealed spherical bearing having a bearing housing, a ball located  
5 therein and a ring-like seal having an inner edge and an outer edge located  
between the bearing housing and the ball, one of the edges having a head and a  
skirt depending therefrom, the head lying in an annular groove formed in one of  
the ball or the housing and the skirt lying on a lip upstanding from the groove to  
define at least two sealing lines between the seal and the one of the ball or the  
10 housing, the other edge of the seal being fixedly mounted to the other of the  
ball or the housing.
2. A sealed bearing according to Claim 1, wherein the groove is formed in  
the ball, the inner edge has the head and the skirt depending therefrom and the  
15 outer edge is fixedly mounted to the bearing housing.
3. A sealed bearing according to Claim 1 or 2, wherein the skirt is directed  
radially inwardly from the head.
- 20 4. A sealed bearing according to any preceding claim, wherein the skirt  
tapers from a root end at the head to a tip end.
5. A sealed bearing according to any preceding claim, wherein the  
upstanding lip is a side-wall of the groove.
- 25 6. A sealed bearing according to any preceding claim, wherein a gap is  
provided between the sealing line defined by the head and the sealing line  
defined by the skirt.



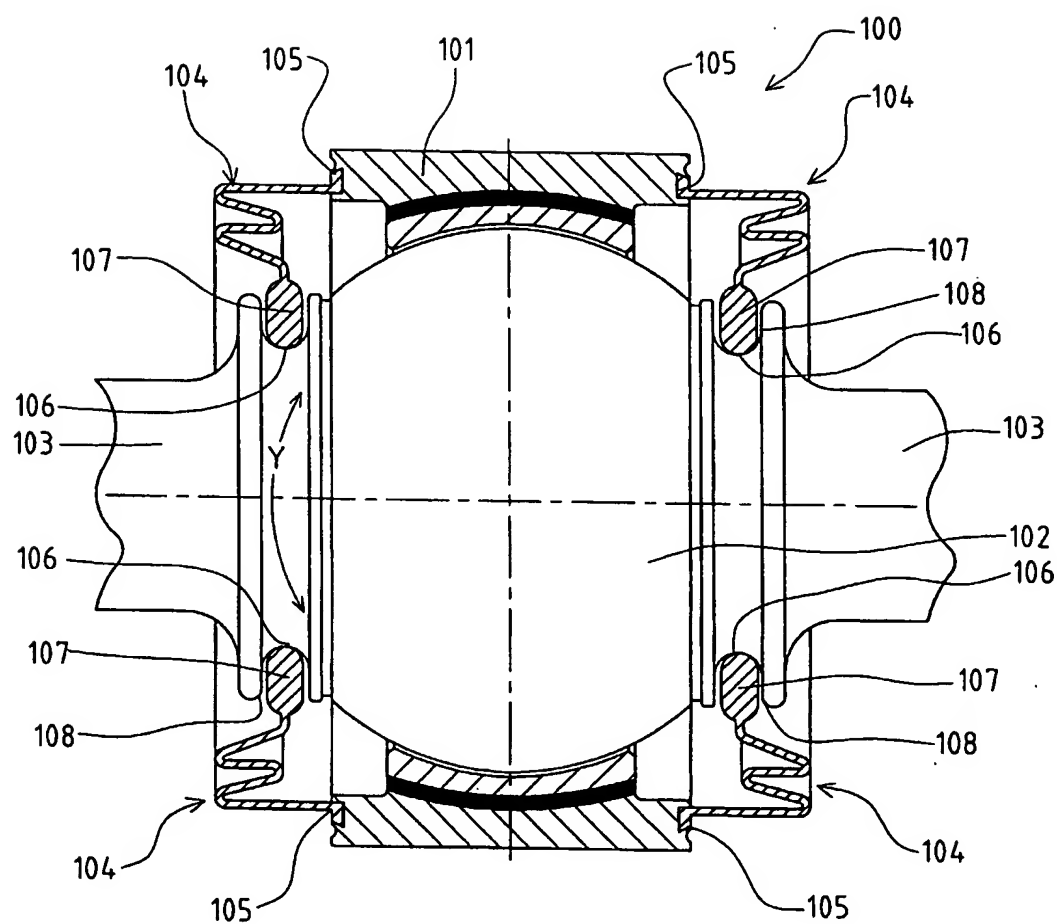
7. A sealed bearing according to any preceding claim, wherein the skirt makes a sealing contact over a circumferential area of the upstanding lip.
- 5 8. A sealed spherical bearing substantially as hereinbefore described with reference to and as shown in the accompanying drawings.
9. Any novel feature or combination of features disclosed herein.

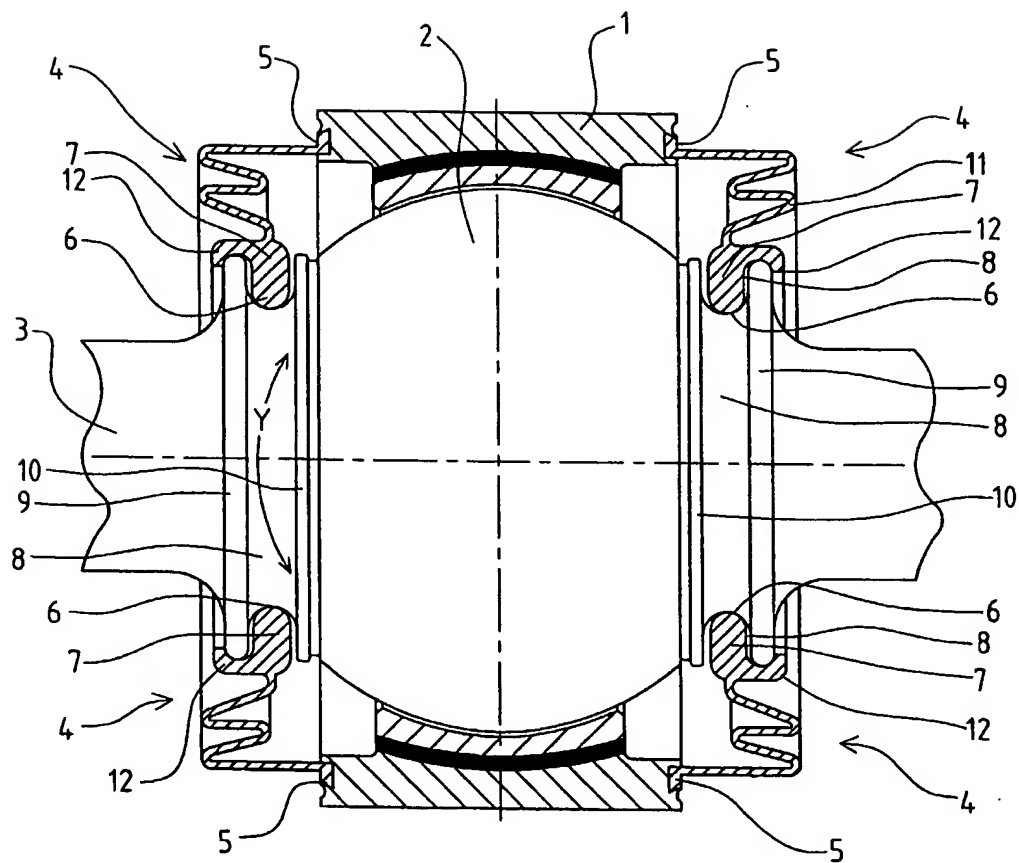
**AMENDED CLAIMS**

[received by the International Bureau on 27 August 2004 (27.08.04);  
original claim 1 amended; original claim 9 cancelled;  
remaining claims unchanged (2 pages)]

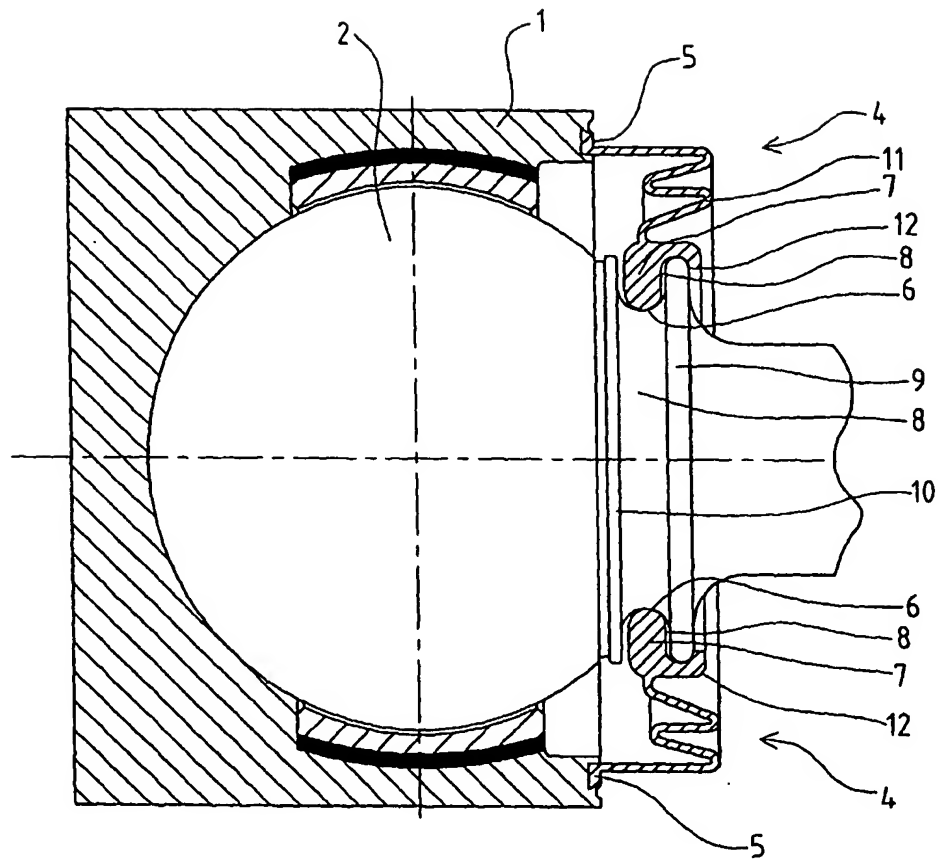
1. A sealed spherical bearing having a bearing housing, a ball located therein and a ring-like seal having an inner edge and an outer edge located  
5 between the bearing housing and the ball, one of the edges having a head and a skirt depending therefrom, the head lying in an annular groove formed in one of the ball or the housing, wherein the head is free to ride in the groove, and the skirt lying on a lip upstanding from the groove to define at least two sealing lines between the seal and the one of the ball or the housing, the other edge of  
10 the seal being fixedly mounted to the other of the ball or the housing.
2. A sealed bearing according to Claim 1, wherein the groove is formed in the ball, the inner edge has the head and the skirt depending therefrom and the outer edge is fixedly mounted to the bearing housing.  
15
3. A sealed bearing according to Claim 1 or 2, wherein the skirt is directed radially inwardly from the head.
4. A sealed bearing according to any preceding claim, wherein the skirt  
20 tapers from a root end at the head to a tip end.
5. A sealed bearing according to any preceding claim, wherein the upstanding lip is a side-wall of the groove.
- 25 6. A sealed bearing according to any preceding claim, wherein a gap is provided between the sealing line defined by the head and the sealing line defined by the skirt.

7. A sealed bearing according to any preceding claim, wherein the skirt makes a sealing contact over a circumferential area of the upstanding lip.
8. A sealed spherical bearing substantially as hereinbefore described with  
5 reference to and as shown in the accompanying drawings.

FIG 1

FIG 2

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FIG 3

# INTERNATIONAL SEARCH REPORT

PCT/GB2004/001300

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 F16C11/06

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 F16C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 198 12 627 A (BAYERISCHE MOTOREN WERKE AG) 30 September 1999 (1999-09-30) figure 2	1-9
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X	DE 39 24 003 A (MUSASHI SEIMITSU KOGYO KK) 22 November 1990 (1990-11-22) figure 1	1-3, 5, 7-9
X	EP 1 114 938 A (MINEBEA KK) 11 July 2001 (2001-07-11) figure 1	1-6, 8, 9

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents :

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- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*G\* document member of the same patent family

Date of the actual completion of the international search

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